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10/596,126	05/31/2006	Euijoon Yoon	21302/0204309-US0	2554

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EXAMINER	
CRAWFORD, LATANYA N	
ART UNIT	PAPER NUMBER
2813	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/596,126	YOON ET AL.	
	Examiner	Art Unit	
	LATANYA CRAWFORD	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) *1-10 and 16* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-15 and 17-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the correspondence filed on 11/24/2008. Currently, claims 11-15 & 17-23 are pending. Claims 1-10 are withdrawn and claim 16 is cancelled.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 11-15 & 17-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The limitation "sequentially along the growth direction" (line 15, pp. 4 of 10) renders the claim ambiguous. The Examiner notes that the recitation "wherein the single quantum well layer comprises sequentially along the growth direction, an In-rich region, a first compositional grading region with In content increasing between the top layer of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) and the In-rich region, and a second compositional grading region with In content decreasing between the In-rich region and the additional nitride semiconductor layer" makes inference to multiple layers and not a single quantum well layer. In order to further prosecution, the Examiner interprets the recitation as referring to a single quantum well layer where the first compositional grading region is defined by the region of the In-rich single quantum well layer and the top layer $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$). Similarly, the second compositional grading region is defined by the

region of the In-rich single quantum well layer and the additional nitride semiconductor layer.

3. Claim 1 recites the limitation "the growth direction" in line 11, pp. 4 of 10. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. The rejection of claims 11, 17, 18, & 20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakamura (US pub no.2003/0015724 A1) has been maintained for reasons of record.

Regarding claim 11, Nakamura et al. discloses a nitride semiconductor light emitting device comprising: a substrate 11; at least one nitride semiconductor layer grown on the substrate and including a top layer of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) 15 [0043]; a single quantum well layer 16 grown on the top layer of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) 15 [0044], the quantum well layer being made of In-rich In GaN resulting from the lattice mismatch with the top layer of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) layer an Ga in the In- rich InGaN being mainly supplied from the top layer of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) [0044][0075]; and an additional nitride semiconductor layer 101 grown on the quantum

well layer and having a band gap energy higher than that of the quantum well layer; Since Nakamura et al. teaches that the quantum well layer has a smaller band gap then that of layer 15 and 101, this means that the quantum well layer has a an indium content higher than layer 15 and 101. This satisfies the limitation: wherein the single quantum well layer comprises an In-rich region, a first compositional grading region with In content increasing between the top layer of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) and the In-rich region [0044], and second compositional grading region with In content decreasing between the In-rich region and the additional nitride semiconductor layer [0044].

Regarding claim 17, Nakamura et al. discloses wherein the additional nitride semiconductor 101 is formed of $Al_y Ga_{1-y}N$ ($0 \leq y \leq 1$) [0048].

Regarding claim 18, Nakamura et al. discloses further comprising at least one barrier layer of $Al_y Ga_{1-y}N$ ($0 \leq y \leq 1$) layer 103 [0054] and having a band gap energy higher than that of the additional nitride semiconductor layer 101[0048]. Since, layer 101 may have some In content, and layer 103 is preferably AlGaN, the band gap of layer 103 will be higher since it lacks In content.

Regarding claim 20, Nakamura et al. discloses wherein the quantum well layer and the at least barrier layer of $Al_y Ga_{1-y}N$ ($0 \leq y \leq 1$) to form a multi-quantum well structure [0045].

Regarding claim 21, Nakamura et al. discloses wherein the pairs of the quantum well and the at least barrier layer of $Al_y Ga_{1-y}N$ ($0 \leq y \leq 1$) equal to or less than 100 pairs [0045].

Regarding claim 22, Nakamura et al. discloses herein the top layer 15 of $Al_xGa_yIn_{1-x-y}N$ ($0 \leq x \leq 1$, $0 < y \leq 1$, $0 < x+y \leq 1$) is GaN [0043].

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The rejection of claims 12, 14, 15, 19 & 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura (US pub no.2003/0015724 A1) in view of Tysoe (US Pub no. 2004/0195598 A1) has been maintained for reasons of record.

Regarding claim 12, Nakamura et al. discloses all the claim limitations of claim 11 but fails to teach wherein the quantum well layer is formed of $In_xGa_{1-x}N$ and x in the In-rich region of the quantum well layer is equal to or more than 0.6.

However, Tysoe et al. teaches wherein the quantum well layer 8 is formed of $In_xGa_{1-x}N$ and x in the In-rich region of the quantum well layer is equal to or more than 0.6 [0045]. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the semiconductor light emitting device of Nakamura et al. with

the quantum well layer is formed of $In_xGa_{1-x}N$ and x in the In-rich region of the quantum well layer is equal to or more than 0.6 taught by Tysoe et al. since doing so would provide a preferred excitation of a GaN light emitting diode

Regarding claim 14, Tysoe et al. discloses wherein the quantum well layer 8 is formed of $In_xGa_{1-x}N$ and x in the In-rich region of the quantum well layer is within a range of 0.5 to 0.8 [0045].

Regarding claim 15, Tysoe et al. discloses wherein the thickness of the quantum well 8 is equal to or less than 2nm [0046].

Regarding claim 19, Nakamura et al. discloses wherein the at least one barrier layer of $Al_y Ga_{1-y}N$ ($0 \leq y \leq 1$) that is not greater than 150 angstroms(15 nm) except having a thickness equal to or less than 5 nm. Prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient to establish a prima facie case of obviousness." In re Peterson, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed. Cir. 2003).MPEP 2144.05

Regarding claim 23, Nakamura et al. discloses x in the In-rich region of the quantum well layer 8 is equal to or less than 0.7 [0045].

8. The rejection of claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura (US pub no.2003/0015724 A1) in view of Yamada (US Pub no. 2003/0209704 A1) has been maintained for reasons of record..

Regarding claim 13, Nakamura et a. discloses all the claim limitations of claim 11 but fails to teach wherein the quantum well layer is grown using an In source and a

nitrogen source, and the thickness of the quantum well is reduced by growth interruption which is performed by supplying the nitrogen source with the supply of the In source intercepted to flatten the surface of the quantum well layer.

However, Yamada et al. teaches the quantum well layer having a flattened surface [0030]. It would It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the semiconductor light emitting device of Nakamura et al. with the quantum well layer having a flattened surface taught by Yamada et al. since doing so improves luminous efficiency. The limitations: grown using an In source and a nitrogen source, and the thickness of the quantum well is reduced by growth interruption which is performed by supplying the nitrogen source with the supply of the In source intercepted are not given patentable weight. "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted). A *"product by process"* claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972): *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); In re Fessmann, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a *"product by, all of"* claim, and not the patentability of the

process, and that an old or obvious product, whether claimed in *"product by process"* claims or not. Note that Applicant has the burden of proof in such cases, as the above case law makes clear.

Response to Arguments

9. Applicant's arguments with respect to claims 11-15 & 17-23 filed on 11/24/2008 have been fully considered but are moot in view of the new ground (s) of rejection regarding the 35 U.S.C. 112, second paragraph issue as stated above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LATANYA CRAWFORD whose telephone number is (571)270-3208. The examiner can normally be reached on Monday-Friday 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571)-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LaTanya Crawford/
Examiner, Art Unit 2813

/W. David Coleman/
Primary Examiner, Art Unit 2823